

111TH CONGRESS  
1ST SESSION

# S. 601

To establish the Weather Mitigation Research Office, and for other purposes.

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IN THE SENATE OF THE UNITED STATES

MARCH 16, 2009

Mrs. HUTCHISON introduced the following bill; which was read twice and referred to the Committee on Commerce, Science, and Transportation

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## A BILL

To establish the Weather Mitigation Research Office, and  
for other purposes.

1 *Be it enacted by the Senate and House of Representa-*  
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Weather Mitigation  
5 Research and Development Policy Authorization Act of  
6 2009”.

7 **SEC. 2. PURPOSE.**

8 It is the purpose of this Act to develop and implement  
9 a comprehensive and coordinated national weather mitiga-  
10 tion policy and a national cooperative Federal and State  
11 program of weather mitigation research and development.

1 **SEC. 3. FINDINGS.**

2 Congress finds the following:

3 (1) According to a 2003 report by the National  
4 Research Council, “people in drought- and hail-  
5 prone areas willingly spend significant resources on  
6 weather mitigation programs, and in 2001 there  
7 were at least 66 operational programs being con-  
8 ducted in 10 States across the United States. At the  
9 same time, less than a handful of weather mitigation  
10 research programs are underway worldwide, and re-  
11 lated research in the United States has dropped to  
12 less than \$500,000 per year from a high of  
13 \$20,000,000 in the late 1970s.” The NRC report  
14 entitled “Critical Issues in Weather Modification Re-  
15 search” also states that “a coordinated national pro-  
16 gram of weather modification research is needed”.  
17 Such a program is supported by States that need a  
18 scientific means of evaluating current programs and  
19 increasing their effectiveness through applied re-  
20 search.

21 (2) Droughts in the United States result in an  
22 average economic loss between \$6,000,000,000 and  
23 \$8,000,000,000 annually, while severe hail pro-  
24 ducing storms result in up to \$2,300,000,000 dam-  
25 age to crops and over \$2,000,000,000 in property  
26 loss annually. Snowpack, rain enhancement, and hail

1 suppression weather mitigation projects help reduce  
2 these losses, and additional research in these areas  
3 will make existing programs even more effective and  
4 permit them to better quantify their impacts. Recent  
5 droughts in the Western United States have pro-  
6 duced low lake levels at Lake Powell and Lake Mead  
7 and have led the Seven Colorado River Basin States  
8 to create cooperative agreements. A separate cooper-  
9 ative agreement is in place for wintertime snowfall  
10 enhancement programs in the States of Utah, Colo-  
11 rado, and Wyoming to pursue water augmentation  
12 to benefit the entire Colorado River System.

13 (3) Past and recent evaluations of the potential  
14 for snowpack augmentation by cloud seeding in the  
15 Colorado River Basin indicate a significant yield in  
16 runoff can be attained through properly designed  
17 projects. A 2006 evaluation by the Bureau of Rec-  
18 lamation of the Department of the Interior indicates  
19 the potential for 800,000 additional acre-feet of  
20 water.

21 (4) The impacts of possible climate change and  
22 the human impact on weather are not well under-  
23 stood. Weather mitigation research could provide  
24 data on what, if any, impact pollution may have on  
25 the precipitation processes in cloud systems. Re-

1 search into inadvertent and planned weather mitiga-  
2 tion may increase our understanding and knowledge  
3 of any potential impacts.

4 (5) The recent Weather Damage Modification  
5 Program conducted by the Bureau of Reclamation  
6 employed a successful model for combining local,  
7 State, and Federal resources in providing a means  
8 for scientific evaluation of operational cloud-seeding  
9 projects (rainfall and snowfall enhancement and hail  
10 suppression) in North Dakota, Oklahoma, Texas,  
11 Colorado, Utah, Nevada, and California.

12 **SEC. 4. DEFINITIONS.**

13 In this Act:

14 (1) Advisory Board.—The term “Advisory  
15 Board” means the Advisory Board established by  
16 section 5(b).

17 (2) DIRECTOR.—The term “Director” means  
18 the Director of the Office appointed under section  
19 5(a).

20 (3) OFFICE.—The term “Office” means the  
21 Weather Mitigation Research Office established  
22 under section 5(a).

23 (4) RESEARCH AND DEVELOPMENT.—The term  
24 “research and development” means theoretical anal-  
25 ysis, exploration, experimentation, and the extension

1 of investigative findings and theories of a scientific  
2 or technical nature into practical application for ex-  
3 perimental and demonstration purposes, including  
4 the experimental production and testing of models,  
5 devices, equipment, materials, and processes.

6 **SEC. 5. WEATHER MITIGATION RESEARCH OFFICE ESTAB-**  
7 **LISHED.**

8 (a) ESTABLISHMENT.—There is established in the  
9 National Science Foundation the Weather Mitigation Re-  
10 search Office to establish and coordinate the national re-  
11 search and development program on weather mitigation  
12 described in section 6. The Office shall be headed by a  
13 Director, who shall be appointed by the Director of the  
14 National Science Foundation.

15 (b) ADVISORY BOARD.—

16 (1) IN GENERAL.—The Office shall have an Ad-  
17 visory Board, the function of which shall be to ad-  
18 vise the Office and to make recommendations to the  
19 Office concerning legislation, policies, administra-  
20 tion, research, and other matters, consisting of 11  
21 members, appointed by the Director of the National  
22 Science Foundation, as follows:

23 (A) At least 2 members shall be represent-  
24 atives of States that are currently supporting  
25 operational weather mitigation programs.

1 (B) At least 2 members shall be a rep-  
2 resentative of the National Center for Atmos-  
3 pheric Research of the National Science Foun-  
4 dation.

5 (C) At least 1 member shall be a rep-  
6 resentative of National Aeronautics and Space  
7 Administration.

8 (D) At least 1 member shall be a rep-  
9 resentative of the American Meteorological So-  
10 ciety.

11 (E) At least 1 member shall be a rep-  
12 resentative of the American Society of Civil En-  
13 gineers.

14 (F) At least 1 member shall be a rep-  
15 resentative of the National Academy of  
16 Sciences.

17 (G) At least 1 member shall be a rep-  
18 resentative of the National Oceanic and Atmos-  
19 pheric Administration of the Department of  
20 Commerce.

21 (H) At least 1 member shall be a rep-  
22 resentative of the Department of Agriculture.

23 (I) At least 1 member shall be a represent-  
24 ative of institutions of higher education or re-  
25 search institutes with experience in the field.

1           (2) TENURE.—A member of the Advisory  
2 Board shall serve at the pleasure of the Director of  
3 the National Science Foundation.

4           (3) VACANCIES.—Any vacancy on the Advisory  
5 Board shall be filled in the same manner as the  
6 original appointment.

7           (c) CHAIR AND VICE CHAIR.—The Advisory Board  
8 shall select a Chair and Vice Chair from among its mem-  
9 bers.

10          (d) INITIAL MEETING.—Not later than 30 days after  
11 the date on which all members of the Advisory Board have  
12 been appointed, the Advisory Board shall hold its first  
13 meeting.

14          (e) MEETINGS.—The Advisory Board shall meet at  
15 the call of the Chair.

16          (f) QUORUM.—A majority of the members of the Ad-  
17 visory Board shall constitute a quorum, but a lesser num-  
18 ber of members may hold hearings.

19          (g) DUTIES OF THE OFFICE.—

20           (1) STUDIES, INVESTIGATIONS, AND HEAR-  
21 INGS.—The Office may conduct studies, obtain in-  
22 formation, and hold hearings necessary to carry out  
23 the purposes of this Act.

1           (2) COOPERATION WITH OTHER AGENCIES.—  
2           The Office may cooperate with public or private  
3           agencies to promote the purposes of this Act.

4           (3) COOPERATIVE AGREEMENTS.—The Office  
5           may enter into cooperative agreements with the head  
6           of any department or agency of the United States,  
7           an appropriate official of any State or political sub-  
8           division of a State, or an appropriate official of any  
9           private or public agency or organization to conduct  
10          research and development pertaining to weather  
11          mitigation.

12          (4) CONDUCTING AND CONTRACTING FOR RE-  
13          SEARCH AND DEVELOPMENT.—The Director may  
14          conduct or contract for research and development  
15          activities in accordance with section 6.

16 **SEC. 6. NATIONAL RESEARCH AND DEVELOPMENT PRO-**  
17 **GRAM ON WEATHER MITIGATION.**

18          (a) IMPLEMENTATION PLAN.—Not later than 180  
19          days after the date of enactment of this Act, the Director,  
20          in consultation with the Advisory Board, shall develop and  
21          submit to Congress a plan for the establishment and co-  
22          ordination of the national research and development pro-  
23          gram required by section 5(a). The plan shall—

24                  (1) for the 10-year period beginning in the year  
25                  it is submitted, establish the goals and priorities for

1 Federal research that most effectively advance sci-  
2 entific understanding of weather mitigation;

3 (2) describe specific activities required to  
4 achieve such goals and priorities, including funding  
5 of competitive research grants, training and support  
6 for scientists, and participation in international re-  
7 search efforts;

8 (3) identify and address, as appropriate, rel-  
9 evant programs and activities of the Federal agen-  
10 cies and departments that would contribute to the  
11 program;

12 (4) consider and use, as appropriate, reports  
13 and studies conducted by Federal agencies and de-  
14 partments, weather modification organizations, and  
15 other expert scientific bodies, including the National  
16 Research Council report entitled “Critical Issues in  
17 Weather Modification Research”;

18 (5) make recommendations for the coordination  
19 of program activities with weather mitigation activi-  
20 ties of other national and international organiza-  
21 tions; and

22 (6) estimate Federal funding for research ac-  
23 tivities to be conducted under the program.

24 (b) PROGRAM ACTIVITIES.—The national research  
25 and development program required by section 5(a) may

1 include the following activities related to weather mitiga-  
2 tion:

3           (1) Interdisciplinary research and development  
4           and coordination of research and development and  
5           activities to improve understanding of processes re-  
6           lating to planned and inadvertent weather mitiga-  
7           tion, including the following:

8                   (A) Research related to cloud and precipi-  
9                   tation physics.

10                   (B) Cloud dynamics and cloud modeling.

11                   (C) Improving cloud seeding-related tech-  
12                   nologies.

13                   (D) Severe weather and storm research.

14                   (E) Research related to potential adverse  
15                   affects of weather mitigation.

16           (2) Coordination with relevant organizations  
17           that engage in weather mitigation research.

18           (3) Development through partnerships among  
19           Federal agencies, State agencies with weather modi-  
20           fication experience, and academic institutions of new  
21           technologies and approaches for weather mitigation.

22           (4) Establishing scholarships and educational  
23           opportunities that encourage an interdisciplinary ap-  
24           proach to weather mitigation.

1           (5) Promotional activities in accordance with  
2 subsection (c).

3           (6) Administering the grant program described  
4 in subsection (d).

5           (c) PROMOTION OF RESEARCH AND DEVELOP-  
6 MENT.—In order to assist in expanding the theoretical  
7 and practical knowledge of weather mitigation, the Office  
8 shall promote and fund research and development, studies,  
9 and investigations with respect to—

10           (1) improved forecast and decision-making tech-  
11 nologies for weather mitigation operations, including  
12 tailored computer workstations and software and  
13 new observation systems with remote sensors; and

14           (2) assessments and evaluations of the efficacy  
15 of weather mitigation.

16           (d) GRANT PROGRAM FOR RESEARCH AND DEVELOP-  
17 MENT.—

18           (1) IN GENERAL.—The Office may establish a  
19 grant program for the award of grants to eligible en-  
20 tities for research and development projects that  
21 pertain to weather mitigation. To the extent prac-  
22 ticable, the grant program shall be modeled after  
23 both the Atmospheric Modification Program imple-  
24 mented by the National Oceanic and Atmospheric  
25 Administration in 1980, and the Weather Damage

1 Modification Program implemented by the Bureau of  
2 Reclamation of the Department of the Interior in  
3 2002.

4 (2) FEDERAL SHARE.—The Office may not  
5 award a grant under this subsection for a project if  
6 the Federal share of such project would be greater  
7 than 65 percent of the project cost, which may in-  
8 clude in-kind services furnished by the participating  
9 entity.

10 (3) ELIGIBLE ENTITIES.—For purposes of this  
11 subsection, an eligible entity is a State agency, insti-  
12 tution of higher education, or nonprofit organization  
13 that has—

14 (A) an established background and exper-  
15 tise in the field of weather mitigation; and

16 (B) experience with working with and co-  
17 ordinating with State agencies.

18 (4) USE OF FUNDS.—A recipient of a grant  
19 under this subsection may only use the grant for a  
20 research and development project that—

21 (A) pertains to weather mitigation; and

22 (B) was in operation on the day before the  
23 date the grant was awarded.

1 **SEC. 7. ANNUAL REPORT ON ACTIVITIES.**

2 (a) IN GENERAL.—Not later than January 31, and  
3 annually thereafter, the Director shall prepare and submit  
4 an annual report to the President, the Senate Committee  
5 on Commerce, Science, and Transportation, and the  
6 House of Representatives Committee on Science and  
7 Technology on the activities conducted pursuant to this  
8 Act during the preceding calendar year, including the fol-  
9 lowing:

10 (1) A summary of the achievements of Federal  
11 weather mitigation research, including federally sup-  
12 ported external research, during the preceding fiscal  
13 year.

14 (2) An analysis of the progress made toward  
15 achieving the goals and objectives of the plan devel-  
16 oped under section 6(a), including the identification  
17 of trends.

18 (3) A copy or summary of the plan required by  
19 section 6(a) and any changes made to the plan.

20 (4) A summary of agency budgets for weather  
21 mitigation activities for the preceding fiscal year.

22 (5) Recommendations, if any, regarding addi-  
23 tional action or legislation that may be required to  
24 assist in achieving the purposes of this Act.

25 (6) A description of the relationship between re-  
26 search conducted on weather mitigation and re-

1 search conducted pursuant to the Global Change Re-  
2 search Act of 1990 (15 U.S.C. 2921 et seq.), as well  
3 as research on weather forecasting and prediction.

4 (7) A description of any potential adverse con-  
5 sequences on life, property, or water resource avail-  
6 ability from weather mitigation efforts, and any sug-  
7 gested means of mitigating or reducing such con-  
8 sequences if such efforts are undertaken.

9 (b) FIRST REPORT.—The first report required by  
10 subsection (a) shall be submitted on January 31 in the  
11 second calendar year following the date of the enactment  
12 of this Act.

13 **SEC. 8. COOPERATION WITH WEATHER MITIGATION RE-**  
14 **SEARCH OFFICE.**

15 The head of any department or agency of the United  
16 States and the head of any other public or private agency  
17 or institution that receives research funds from the United  
18 States shall, to the extent practicable, cooperate with the  
19 Office for purposes of carrying out this Act.

20 **SEC. 9. FUNDING.**

21 (a) AUTHORIZATION OF APPROPRIATIONS.—There  
22 are authorized to be appropriated to the Office for the  
23 purposes of carrying out this Act \$25,000,000 for each  
24 of the fiscal years 2010 through 2014. Amounts appro-

1 priated pursuant to this subsection shall remain available  
2 until expended.

3 (b) ALLOCATION.—Of the amounts appropriated to  
4 the National Science Foundation under subsection (a) for  
5 each fiscal year—

6 (1) 66 percent shall be available to, and re-  
7 tained by, the National Science Foundation for use  
8 in carrying out its responsibilities under this Act;

9 (2) 34 percent shall be transferred by the Na-  
10 tional Science Foundation to—

11 (A) the National Oceanic and Atmospheric  
12 Administration; and

13 (B) the National Aeronautics and Space  
14 Administration.

15 (c) COMPETITIVE GRANTS.—The Director of the Na-  
16 tional Science Foundation and the Administrators of the  
17 National Oceanic and Atmospheric Administration and  
18 the Aeronautics and Space Administration shall each allo-  
19 cate at least 50 percent of the amounts retained by or  
20 transferred to their respective entities under subsection  
21 (b) for each fiscal year to competitive grants.

22 (d) GIFTS.—The Office may accept, use, and dispose  
23 of gifts or donations of services or property.

○